

**In the Claims**

The following listing of claims replaces all prior versions of the claims:

1 - 17. (Canceled).

18. (New) A system, comprising:

a memory storing a problem;

a processor coupled to the memory, the processor comprising:

means for constructing a data structure representative of the problem, the data structure comprising nodes representing variables of the problem and constraints of the variables;

means for delivering messages between a variable of the variables and at least one constraint of the variable;

means for calculating a probability of the variable satisfying the at least one constraint of the variable based on the messages delivered;

means for providing a solution to the problem based on the probability; and

an output device coupled to the processor, the output device outputting the solution of the problem.

19. (New) The system of claim 18, the data structure comprising a graph.

20. (New) The system of claim 18, the data structure comprising a list.

21. (New) The system of claim 18, each variable of the problem comprising at least one constraint.

22. (New) The system of claim 18, each variable of the problem comprising at least one possible state, the at least one state representing a solution to the problem.

23. (New) The system of claim 18, each constraint of the constraints corresponds to at least one variable.

24. (New) The system of claim 18, the messages comprising a list of binary number equaling the number of possible states of the variable.
25. (New) The system of claim 24, the list comprising  $2^q$  entries,  $q$  equaling the number of possible states for the variable.
26. (New) The system of claim 24, the messages comprising warning messages indicating a state of the variable is not compatible with the at least one constraint.
27. (New) The system of claim 26, the means for delivering comprise sending warning messages from the at least one constraint to the variable.
28. (New) The system of claim 26, the messages comprising void messages indicating a state of a variable is compatible with the at least one constraint.
29. (New) The system of claim 28, the means for delivering comprise sending void messages from the at least one constraint to a corresponding variable.
30. (New) The system of claim 18, the messages comprising a list of integer values related to a variable, the list of integer values equaling the number of possible states of the variable and each integer value totaling the number of warning messages received by the variable from other corresponding constraints.
31. (New) The system of claim 30, the means for delivering comprise sending an integer value from the variable to the at least one corresponding constraint.
32. (New) The system of claim 18, the messages comprising a list of integer values related to the variable, the list of integer values equaling the number of possible states of the variable, and each integer value totaling the number of void messages received by the variable from other corresponding constraint.
33. (New) The system of claim 32, the means for delivering comprise sending an integer value from the variable to the at least one corresponding constraint.

34. (New) The system of claim 18, further comprising means for arranging the variables of the problem and the constraints into a truth table to determine a possible state for each variable.
35. (New) The system of claim 18, further comprising means for constructing a look-up table comprising the constraints and the variables to determine if the constraints are satisfied.
36. (New) The system of claim 35, further comprising means for updating the look-up table to determine a probability that the constraints will not be satisfied for each state of the variables.
37. (New) The system of claim 18, further comprising means for assigning a state to the variable when all constraints of the variable is reduced or satisfied.
38. (New) The system of claim 18, further comprising means for implementing a penalty function if the variables do not satisfy any constraints, the penalty function determining a probability of satisfying all constraints of each variable in a given state.
39. (New) The system of claim 18, further comprising means for randomly choosing a constraint and a corresponding variable to begin solving the problem.
40. (New) The system of claim 18, further comprising means for choosing one variable and all corresponding constraints to begin solving the problem.
41. (New) A method for solving a problem, comprising:
- constructing in constructing means a data structure representative of the problem comprising a set of variables, each variable of the set having at least one corresponding constraint;
  - delivering in delivering means messages between a variable of the set of variables and the at least one corresponding constraint; and
  - calculating in calculating means a set of numbers dependent on the messages, each number in the set of numbers representing a probability of satisfying all constraints of the variable in a given state.

42. (New) The method of claim 41, the data structure comprising a graph.
43. (New) The method of claim 41, the data structure comprising a list.
44. (New) The method of claim 41, the at least one corresponding constraint corresponding to at least one variable of the set.
45. (New) The method of claim 41, each variable of the set of variables comprising at least one possible state, each state representing a solution to the problem.
46. (New) The method of claim 41, the messages comprising a list of binary number equaling the number of possible states of the variable.
47. (New) The method of claim 46, the list comprising  $2^q$  entries,  $q$  equaling the number of states for the variable.
48. (New) The method of claim 46, the messages comprising warning messages indicating a state of the variable is not compatible with the at least one constraint.
49. (New) The method of claim 48, the delivering means comprising sending warning messages from the at least one constraint to the variable.
50. (New) The method of claim 46, the messages comprising void messages indicating a state of the variable is compatible with the at least one constraint.
51. (New) The method of claim 50, the delivering means comprising sending void messages from the at least one constraint to the variable.
52. (New) The method of claim 41, the messages comprising a list of integer values related to the variable, the list of integer values equaling the number of possible states of the variable and each integer value totaling the number of warning messages received by the variable from other corresponding constraints.
53. (New) The method of claim 52, the delivering means comprising sending an integer value from the variable to the at least one corresponding constraint.

54. (New) The method of claim 41, the messages comprising a list of integer values related to the variable, the list of integer values equaling the number of possible states of the variable, and each integer value totaling the number of void messages received by the variable from other corresponding constraint.
55. (New) The method of claim 54, the delivering means comprising sending an integer value from the variable to the at least one corresponding constraint.
56. (New) The method of claim 41, the set of numbers equaling the number of possible states of the variable.
57. (New) The method of claim 41, further comprising arranging in arranging means each variable of the set of variables and the at least one constraint into a truth table to determine a possible state for each variable.
58. (New) The method of claim 41, further comprising constructing in constructing means a look-up table comprising the at least one constraint and all variables associated with the at least one constraint to determine if the at least constraint is satisfied.
59. (New) The method of claim 58, further comprising updating in updating means the look-up table to determine a probability that the at least one constraint will not be satisfied for each state of all variables associated with the at least one constraint.
60. (New) The method of claim 41, further comprising assigning in assigning means a state to the variable when all constraints of the variable is reduced or satisfied.
61. (New) The method of claim 41, further comprising implementing in implementing means a penalty function if each variable in the set of variables does not satisfy any constraints, the penalty function determining a probability of satisfying all constraints of each variable in a given state.

62. (New) The method of claim 41, prior to the step of delivering, randomly choosing in a choosing means a constraint and a corresponding variable to begin solving the problem.

63. (New) The method of claim 41, prior to the step of delivering, choosing in a choosing means one variable and all corresponding constraints to begin solving the problem.

64. (New) A computer program, comprising computer or machine-readable program elements translatable for implementing the method of claim 41.

65. (New) A method for solving a problem, comprising:

implementing in implementing means a cavity-bias survey, the cavity-bias survey

sending in sending means messages from a constraint to a corresponding

variable to determine if the corresponding variable satisfies the constraint;

implementing in implementing means a cavity-field survey, the cavity-field

survey sending in sending means messages from the corresponding

variable to the constraint to determine if the variable satisfy other

constraints related to the variable;

solving in solving means a probability if a given state of the variable satisfy the

constraint based on the messages; and

assigning in assigning means a state to the variable from the probability to solve

the problem.

66. (New) A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform the method for solving a problem, the method steps comprising:

constructing in constructing means a data structure representative of the problem

comprising a set of variables, each variable of the set having at least one

corresponding constraint;

delivering in delivering means messages between a variable and its at least one corresponding constraint; and  
calculating in calculating means a set of numbers dependent on the messages, each number in the set of numbers representing a probability of satisfying all constraints of the variable in a given state.